

## CLAIMS

1. A photonic band gap micro-resonator device, comprising an array of regular elements in a surrounding matrix arranged in a grid, wherein in at least one of a plurality of selected element positions an irregularity is presented in the form of two or more elements replacing a single regular element of the array.
2. The device of claim 1, wherein the array is two-dimensional.
3. The device of claim 1, wherein the array is three-dimensional.
4. The device of claim 1, wherein the irregularity comprises two elements.
5. The device of claim 1, wherein the irregularity comprises four elements.
6. The device of claim 5, wherein the irregularity is in the form of a diamond.
7. The device of claim 6, wherein the irregularity is in the form of a stretched diamond.
8. The device of claim 1, wherein the irregularity comprises elements that are smaller in dimension than the regular elements.
9. The device of claim 1, wherein the irregularity comprises elements that are made from material other than the material from which the regular elements are made.
10. The device of claim 1, wherein the irregularity comprises elements surrounded by a surrounding matrix of different character than the surrounding matrix of the regular elements.

11. The device of claim 1; wherein the irregularity comprises elements that are aligned with axes of the array.
- 5 12. The device of claim 1, wherein the irregularity comprises elements that are rotated with respect to axes of the array.
13. The device of claim 1, wherein the irregularity comprises elements that are of a shape different than the shape of a regular element.
- 10 14. The device of claim 1, wherein the irregularity is characterized as a combination of characteristics selected from the group of characteristics including: elements that are smaller in dimension than the regular elements, elements that are made from material other than the material from which the regular elements are made, elements surrounded by a surrounding matrix of different character than the surrounding matrix of the regular elements, elements that are aligned with the regular elements, elements that are rotated with respect to the regular elements and elements that are of a shape different than the shape of a regular element.
- 15 20 15. The device of claim 1, further comprising two channels for traversing electromagnetic radiation within the array, with the irregularity positioned between the channels, producing a channel drop filter.
- 25 16. The device of claim 15, wherein the channels are optical channels.
17. The device of claim 15, wherein the channels are substantially parallel.
18. The device of claim 1, wherein a plurality of irregularities is provided in the array in the form of a periodic line of that serves as a dispersive waveguide.
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19. The device of claim 18, wherein the irregularity comprises two elements in the form of two parts of a split cylinder kept at a predetermined distance.
- 5 20. The device of claim 19, wherein the predetermined distance is adjustable.
21. A method for photonic band gap micro-resonance comprising:  
providing an array of regular elements regular elements in a surrounding  
matrix arranged in a grid, wherein in at least one of a plurality of selected element  
10 positions an irregularity is presented in the form of two or more elements  
replacing a single regular element of the array; irradiating electromagnetic  
radiation through to the irregularity causing a resonance effect.
22. The method of claim 21, wherein the array is two-dimensional.
- 15 23. The method of claim 21, wherein the array is three-dimensional.
24. The method of claim 21, wherein the irregularity comprises two elements.
- 20 25. The method of claim 21, wherein the irregularity comprises four elements.
26. The method of claim 21, wherein the irregularity is in the form of a  
diamond.
- 25 27. The method of claim 26, wherein the irregularity is in the form of a  
stretched diamond.
28. The method of claim 21, wherein the irregularity is resonated as a  
monopole.

29. The method of claim 21, wherein the irregularity is resonated as a dipole

30. The method of claim 21, wherein the irregularity is resonated as a quadra-  
pole.

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31. The method of claim 21, wherein the irregularity comprises elements that  
are smaller in dimension than the regular elements.

32. The method of claim 21, wherein the irregularity comprises elements that  
10 are made from material other than the material from which the regular elements  
are made.

33. The method of claim 21, wherein the irregularity comprises elements  
surrounded by a surrounding matrix of different character than the surrounding  
15 matrix of the regular elements.

34. The method of claim 21, wherein the irregularity comprises elements that  
are aligned with the regular elements.

20 35. The method of claim 21, wherein the irregularity comprises elements that  
are rotated with respect to the regular elements.

36. The method of claim 21, wherein the irregularity comprises elements that  
are of a shape different than the shape of a regular element.

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37. The method of claim 21, wherein the irregularity is characterized as a  
combination of characteristics selected from the group of characteristics  
including: elements that are smaller in dimension than the regular elements,  
elements that are made from material other than the material from which the  
30 regular elements are made, elements surrounded by a surrounding matrix of

different character than the surrounding matrix of the regular elements, elements that are aligned with the regular elements, elements that are rotated with respect to the regular elements and elements that are of a shape different than the shape of a regular element.

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38. The method of claim 21, further comprising two channels for traversing electromagnetic radiation within the array, with the irregularity positioned between the channels, producing a channel drop filter.

10 39. The method of claim 38, wherein the channels are optical channels.

40. The method of claim 38, wherein the channels are substantially parallel.

15 41. The method of claim 21, wherein a plurality of irregularities is provided in the array in the form of a periodic line of that serves as a dispersive waveguide.

42. The method of claim 41, wherein the irregularity comprises two elements in the form of two parts of a split cylinder kept at a predetermined distance.

20 43. The method of claim 42, wherein the predetermined distance is adjustable.

44. A photonic band gap micro-resonator device substantially as described in the present specification, accompanying drawings and appending claims.

25 45. A method for photonic band gap micro-resonance substantially as described in the present specification, accompanying drawings and appending claims.